

EM375 Project Handout PROJECT OVERVIEW

OBJECTIVE: The aim of this project is for students to demonstrate several skills by solving a real-world engineering problem. The project is to use a launcher to fire a ball at a target located between 100 and 200 feet from the launcher. The project requires proficiency in sample testing and analysis, computer modeling, data collection, data reduction, data analysis, and simulation.

METHODOLOGY: Each team of students will develop a firing solution that relates the stretch of the slingshot and the firing angle to the distance the projectile will travel. In order to generate this firing solution, two basic tasks will have to be accomplished:

1. Establish the relationship between the stretch in the slingshot and the launch speed of the balloon.
2. Establish the relationship between the launch speed and angle, and the impact distance of the balloon.

By dividing the project into these two independent tasks, members of the team can work on the tasks simultaneously. For project management purposes, the two tasks listed above can be broken down into sub tasks as follows:

TASK 1

- a. Determine the elastic properties of the slingshot tubing (“Rubbers Lab”)
- b. Generate firing solutions that relate elongation to launch velocity
- c. Uncertainty analysis of range as a function of launch angle and stretch ratio.

TASK 2

- a. Develop a Mathcad simulation of the projectile problem
- b. Use the scale model of the launcher to collect projectile problem data (“Firing Lab”)
- c. Generate a firing solution that relates launch speed and angle to projectile distance.

DELIVERABLES: The following items will be delivered as part of this project:

1. Firing solution curves and the MathCAD worksheets (printed copies) used to make the curves. One copy per group.
 - a. Graph of distance vs. launch speed. The graph will show three curves, one for each of three different launch angles (10, 20 & 30°)
 - b. Graph of launch speed vs. stretch ratio (? = 1 to 2.5)
2. Complete uncertainty analysis of the range as a function of launch angle and stretch ratio.
3. One formal written report per group. See the separate handout for details.

DUE DATES:

Preliminary Firing Curves:
Field Day:
Final Report:

Sections 2121, 4321

Monday, October 30th
Thursday, November 2nd
Thursday, November 16th

Sections 1111, 3311

Thursday, November 3rd
Tuesday, November 7th
Tuesday, November 21st